Surprisingly Nostalgic

What is it about classical control that attracts us? Is it the math that we find so intriguing? Is it the sense that, despite decades of "modern control" research, classical control tools and insights remain—arguably—the most effective weapon in the control practitioner's arsenal? Or is it a touch of nostalgia for the simpler single-input, single-output (SISO) and analog days, when embedded code did not yet exist?

In the February 2005 special section, "Innovations in Undergraduate Control Education, Part II," *IEEE Control Systems Magazine* published two articles that discussed links between Bode and root locus analysis. The insights of those articles—by Associate Editors Kent Lundberg and Takis Tsiotras—suggested to me that classical control is a remarkably subtle subject that can continue to fascinate and surprise us. What other surprises might be hiding?

The articles in this special section, Classical Control Revisited, came together gradually and unexpectedly from diverse sources. The germ was a talk that Dan Davison gave at the University of Michigan in 2004 on the number of controller degrees of freedom. The basic setting was classical, but the results were—again—surprising.

Around that time I received a submission from Bill Messner, Mark Bedillion, Lu Xia, and Duane Karns on a nonclassical variation of classical lead and lag filters as well as a manuscript from Wieslaw 'Wiesiek' Krajewski and Umberto Viaro on new insights into root locus. It slowly dawned on me that I had the components of a special section that could take a fresh look at classical control issues and tools. The project
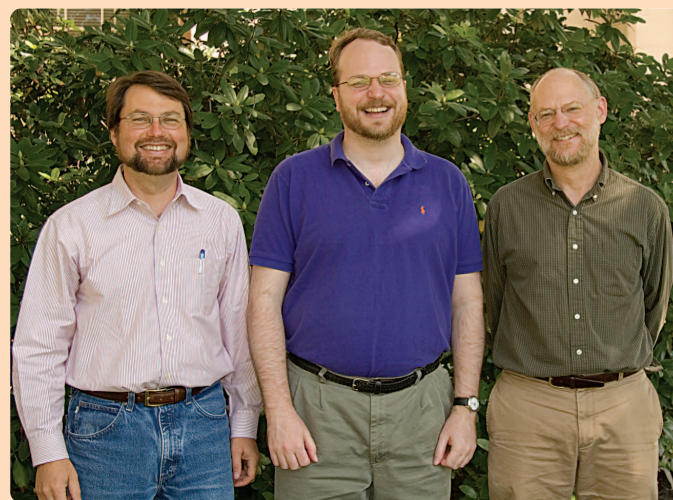
Contributors

Wieslaw Krajewski and Karol.

Jie Chen, after descending from a climbing trip above 6,000 meters in Sichuan province in Northwestern China.

Daniel Davison, his wife May-Jane, and their daughter Miranda.

Mark Bedillion.

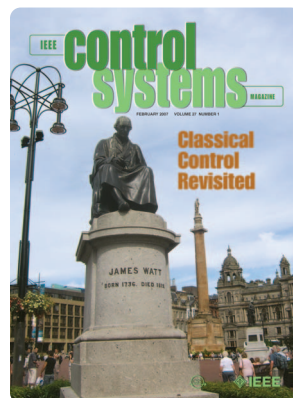From left: David Trumper, Kent Lundberg, and Haynes Miller.

became a reality when Dan agreed to write up his ideas on controller degrees of freedom, and he, together with Jie Chen (the Bode integral guru), consented to serving as guest editors.

In the meantime, Kent Lundberg, David Trumper, and Haynes Miller volunteered to tackle one of the thorniest points in Laplace transform theory, namely, the "zero-plus-versus-zero-minus" schism, known infamously as "troubles at the origin." Informal discussion on this point had continued sporadically since Jessy Grizzle's book review appeared in the June 2004 issue of *IEEE Control Systems Magazine*. It was clear that the special section would provide an excellent venue for getting to the bottom of this issue.

Finally, an article by Jaganath Chandrasekhar and myself addresses the question of what can be done if a classical servo loop has an unknown bias in the sensor measurements as well as an unknown offset in the actuator. It turns out that integral control is only part of the story.

The leadoff article by Dan and Jie provides additional background on the special section and motivates the content of each article. To complement these feature articles, we bring you a history column by Chris Bissell on the Moniac analog computer. While many of us know that money can flow like water, the Moniac exploited the converse fact, namely, that water can flow like money. This issue also includes reviews of three books with a direct relation to classical control. For the Lighter Side, Dan Simon contributes his second crossword puzzle, which reflects the theme of the special section. For Dan's first contribution, see the October 2006 issue but don't peek at the solutions.

Now, a few words about what's in store for the rest of 2007 and beyond. In addition to more articles on classical control, we'll soon begin a series of articles on modeling. These articles are major invited works that reflect the importance of modeling to our community as well as our unique insights into the process and tools of modeling for analysis, simulation, and control. We also have several special issues in preparation on topics ranging from complex networks to system identification to inertially stabilized platforms. Looking farther ahead—as far as 2009 and 2010—our Kalman filter anniversary special issue plans are moving forward and—dare I say it?—gaining momentum.

Finally, let me remind you that *IEEE Control Systems Magazine* publishes letters from readers on any aspect of the magazine. Please share your views. Oh, yes, I almost forgot to mention that we're always seeking short, technology-related articles on any aspect of control. I hope to hear from you.